NONPROVISIONAL UTILITY PATENT APPLICATION
of
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SPECIFICATION

TITLE OF INVENTION

BINOCUCORDER

CROSS-REFERENCE TO RELATED APPLICATIONS

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STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

REFERENCE TO A MICROFICHE APPENDIX

Not applicable.

BACKGROUND OF THE INVENTION

0001 This invention relates to a device, herein termed a "binocucorder", which comprises a digital video camera (a "camcorder") of the recently introduced type which is substantially the size of a person's hand and which includes a Liquid Crystal Diode ("LCD") monitor incorporated in a door that swings open laterally from one side of the camcorder's housing, said specific type of camcorder being mounted on top of a binocular having a wide angle field of view; wh rein such camcorder and binocular are

cooperatively related such that the binocular operated in wide-angle mode normally serves as the target acquisition and centering means for the camcorder, as opposed to using the LCD monitor for that purpose; the camcorder being thereby normally operable in substantial telephoto mode with certainty of recording the target and without loss of a moving target, the optical superiority of the binocular being utilized to see a target and center on a target, particularly a distant target, and especially a nighttime target, even before it becomes visible in the LCD monitor of such camcorder.

0002 Camcorders used to be bulky and were (and still are) provided with a "viewfinder" which is an eyepiece through which the user had to peer in order to view a small video screen on which the target was electronically displayed while being recorded on a videotape cassette. Difficulty locating a target in the small screen of the viewfinder even in the daytime let alone at night, led to the addition of the significantly larger "LCD monitor" which activates automatically when the door in which it is incorporated is swung open. Simultaneously with this improvement, camcorders which were so equipped were caused to operate digitally and were made much smaller and lighter in weight, and they have recently been reduced in size even further such that such camcorders can now fit in the palm of one's hand. Although the LCD monitor is a significant improvement, user's continue to find that acquisition and maintenance of the centering of a target in the LCD monitor, particularly a distant target, remains difficult, due to the lesser sharpness of the image seen electronically in the LCD monitor as compared to what can be se n with the naked eye, and that difficulty is aggravated when the camcorder is being op rated in some degree of t lephoto mode because the field of view is then significantly reduced. Thes limitations are

especially noticeable when attempt is made to vid otap a distant targ t at night. Typically, before the user can zoom the camcorder in on a targ t, he must first operate the camcorder in wide-angle mode in order to acquire the target and then zoom in on it once it is centered in the LCD monitor. But the target, especially a moving target, is then easily lost due to the then existent narrower field of view, which requires going back to wide angle mode in order to reacquire the target. Obviously, the time taken to perform these operations reduces the time during which a moving subject can be recorded close up.

0003 Many events, especially sporting events, are best enjoyed when one has the widest field of view. Each time the camcorder is operated into telephoto mode to "pull in" a subject of particular interest, that wide field of view is reduced, with corresponding loss of sight of what may be happening outside that reduced field of view. As a result, videotaping an event reduces the camcorder operator's enjoyment of the event as a whole.

0004 As mentioned above, the limited usefulness of the LCD monitor becomes especially evident when the camcorder is used at night. It is frequently difficult, and sometimes impossible, for example, to see an aircraft against a dark sky in the LCD monitor. But, as is well known, such a subject is easily seen when using a binocular.

0005 It is desired to enhance the ease with which a subject can be acquired, whether by day or by night, and kept c ntered for recording by a camcorder of the LCD-inclusiv type described, by mounting such camcorder on a binocular that is either fix d in wide angle fi ld of view, or, is

a zoom type binocular that is adjustable to a wide field of view, the binocular and the camcorder being cooperatively related such that both are always sighted on the same target, whereby the binocular may thereby normally be used as the target acquisition and centering means for the camcorder instead of the LCD monitor. The camcorder may thereby normally be operated in some degree of telephoto mode with certainty that the target is being recorded so long as the user maintains the target centered in the field of view of the binocular. Since the target will always be easier to see using the binocular, the user will always be assured that the target is in fact centered in the line-of-sight of the camcorder even if the target is not immediately visible in the LCD monitor. This cooperative relationship greatly enhances the effectiveness of the camcorder.

0006 It is further desired to provide such a device in such a compact size and light enough in weight that it can be conveniently hand-held, like a binocular when used alone. Accordingly, attainment of the results sought by the present improvement are dependent upon utilization of a camcorder, inclusive of an LCD monitor, which is of the smallest possible size, comparable in length to that of the binocular itself. Such LCD-equipped camcorders currently exist. Some, recently introduced and termed "mini-camcorders", are small enough to fit in the palm of one's hand and are so light in weight as to only minimally add to the weight of a binocular on which they might be mounted. Such a combination (a "binocucorder") is conveniently hand-holdable, is as easy to carry about as is a binocular, and is as ready at all times for immediate use as is a binocular.

0007 The user may then watch an event using only the binocular portion of his binocucorder, which is set in wide angle mode, enjoying the widest possible view of the event or easily acquiring a target, especially at night, while being assured that the camcorder, which has been set in a preferred telephoto mode, is positively recording a centered target of particular interest at close range. Daytime sporting events may thereby be enjoyed without interruption with a continuous wide angle view of the event, and nighttime subjects are quickly and easily acquired with certainty of positive centering of the subject in the camcorder. While the LCD monitor may still be used for centering the target when the camcorder is used indoors where subjects are at extreme close range, at all other times it serves only as the means of monitoring the operating mode of the camcorder, and for viewing playback. Since the opened LCD monitor door is located immediately above the eyepieces of the binocular, only a slight upward glance is required whenever it is desired to check the operating configuration of the camcorder, such as confirming that the camcorder is in fact recording and not in pause mode, the degree of telephoto, the condition of the battery, etc.

0008 Camcorders are conventionally provided with a means for securing to a stable external support such as a tripod. The use of a tripod is preferred when videotaping subjects at a distance, especially when using the camcorder in telephoto mode.

0009 Conventionally, a tripod includes a detachable plate-like element, termed a "sho ", that is provided for attachment to the undersid of a camcorder by means of a scr w (the undersid of th camcorder b ing

conventionally configured for such accommodation), and such shoe includes a pin adjacent to the screw which is receiv d by the camcorder wher by the camcorder is positively prevented from rotating around the tightened screw. The shoe has opposite edges which are beveled, and it is received in a second element that forms a part of the upper end of the tripod, a first one of the beveled edges of the shoe hooking under a correspondingly beveled wall of the receiving element and the other or second one of the beveled edges of the shoe being engaged by a cam inclusive of a lever which forms a part of the receiving element and which the user manipulates so as to cause the cam to hook over and jam onto the said second beveled edge of the shoe, whereby the camcorder being carried by the shoe is firmly secured to the tripod.

0010 The mounting means described above is less than ideal for use with the invention binocucorder because the underside of the camcorder is only accessible between the tubular body portions of the binocular, and there may not be enough room there for easy manipulation of the shoe's cam lever. Alternatively, the underside of the binocular could be configured to accept such a shoe, but since the camcorder is mounted on top of the binocular, the camcorder would then be located well above the shoe, which may introduce camera shake, and that must be avoided.

0011 Accordingly, it is further desired to provide the invention binocucorder inclusive of a means of attachment to an external support; wherein such means is easier to use than th conventional means, ensures a positive attachment even when attach d in darkness, and which rigidly

supports both the camcord r and the binocular in the closest possibl proximity to the upper end of the tripod or other support means.

0012 The prior art is not known to disclose a miniature LCD-equipped camcorder mounted on a binocular. The nearest prior art known appears to be a digital still photo camera incorporated in the body of a binocular between the tubular structures which house the optical elements of the binocular, and which has the capability of displaying on an included LCD monitor the last 30 seconds of what has been viewed through the binocular. A camcorder cannot be so located because said tubular structures would block opening of the LCD monitor, and also block opening of a second door which is located on the opposite side of the camcorder by means of which video cassettes are inserted into and removed from the camcorder. And the prior art is not known to provide the mounting means disclosed herein.

BRIEF SUMMARY OF THE INVENTION

0013 The main object of the invention is to provide an LCD-inclusive miniature camcorder mounted on top of a binocular that is either fixed in or is adjustable to a wide angle field of view; in such a position thereon that the focus adjustment wheel and the zoom control lever, if any, of the binocular remains accessible for manual operation. Of course, the camcorder's line-of sight will then be spaced well above the line-of-sight of the binocular, and therefore a subject centered on the binocular's line-of-sight will not be centered in the camcorder's line-of-sight unless further measures are taken to compensate for that separation. Two different means of attaining that result are disclosed.

0014 It is an object of the present disclosur to provide an embodiment of the invention binocucorder wherein the means for causing the camcorder and the binocular to sight on a common target comprises the camcorder being angularly mounted on the binocular so as to cause the camcorder's line-of-sight to converge toward and intersect the binocular's line-of-sight at a distance. This embodiment is the simplest, and permits use of a stock camcorder which is detachably mounted on a suitably modified binocular. A further advantage is that since all of the light reflected from the target arrives at the objective lens of the camcorder, its sensitivity for nighttime use is maximized. Of course, perfect centering of the subject on the camcorder's light-of-sight will exist only when the subject is located precisely at the point of convergence of the two lines of sight, and at other locations of the subject there will be a difference. Accordingly a suitable convergence point is preselected and is fixed in accordance with what is deemed to be typical use, and for significantly different other locations of the target closer or further away the user must compensate by aiming the binocular a little higher or a little lower if perfect centering of the recorded image is required.

0015 It is a further object to provide an embodiment of the invention binocucorder wherein the means used to cause the camcorder and the binocular to sight on a common target comprises a periscope which receives incident light on the binocular's effective line-of-sight and reflects it upwardly onto the camcorder's line-of-sight. Accordingly, it is an object of the invention to provide a camcorder having a housing a rearward portion of which houses the elements of th camcorder, including th LCD monitor, and a forward portion of which comprises a periscope that has its light-receiving end located centered betw n the objective lenses of the binocular, the

periscope being proportioned narrow enough in width to fit therebetween. The periscope preferably utilizes mirrors of the "first-surface" type; and it is a further object to provide the said forward portion of the camcorder's housing which defines the periscope comprising a permanently sealed, dust-free compartment which is provided with either a plain glass window or the objective lens of the camcorder through which incident light passes to reach the lower one of the two mirrors which are contained inside the periscope. As is well-known, a "first-surface" mirror is one which has its reflective material deposited on the surface that is nearest the incident light, whereby light is reflected off the mirrors without passage through any glass, thereby minimizing light loss due to passage through glass . Through use of such first-surface mirrors, the amount of light received by the camcorder is minimally reduced, and because the mirrors are permanently sealed inside a dust-free compartment, neither the mirrors of the periscope nor the optics of the camcorder are ever exposed to dust and so never require cleaning beyond wiping the external surface of the element (plain glass window or the objective lens of the camcorder, as the case may be) through which incident light enters the periscope. The advantage of this periscope embodiment is that at any distance of the subject from the user, so long as the subject is centered in the field of view of the binocular it will necessarily be centered in the camcorder's line-of-sight.

0016 It is a further object to provide two versions of the periscope embodiment, a first one in which incident light enters the periscope by passage through a plain glass window and the objective lens of the camcorder remains conventionally placed, and a second version in which the window is replaced by the objective l ns of the camcorder so that

incident light does not have to pass through any glass that is not a part of the camcorder's optical system, this being preferred in order to hold light loss to a minimum. In the case of this second version of the periscope embodiment, incident light enters the periscope by passage directly through the objective lens of the camcorder and the light is then reflected by the mirrors onto the remaining lenses of the camcorder's optical system which remain mounted in the camcorder and which complete the processing of the light to form the final image.

0017 The embodiment wherein the camcorder is angularly mounted on the platform is also provided in two versions: a first one in which a conventional camcorder is detachably mounted on the platform which includes a locator pin and through which platform a screw is passed and threaded into the underside of the camcorder whereby the camcorder is fastened onto the platform; and a second version in which the camcorder has a housing that is formed in one piece with said platform.

0018 Another object to provide a means for attachment of the invention binocucorder to an external support means, such as a tripod, wherein such means comprises a tube that is fixed to and depends from the underside of the platform or camcorder housing, as the case may be. The tubing is simply lowered onto a post which forms a part of such tripod, the inside walls of the tube having a tapered configuration which obtains a jammed fit onto the correspondingly configured post. Since the post thereby reaches upwardly to th very underside of the platform or camcorder housing, as the case may be, the camcorder is secur d to the post at the closest proximity to the post, th reby minimizing cam ra shake; and the

forward location of the tube nearest the camcorder's optical elements further minimizes camera shak . The tube is cross-sectionally configur d to prev nt its rotation around the vertical axis of the post; e.g., by providing it square in cross-section. Since the tube is simply dropped onto the post, where it instantly obtains a jammed fit thereon, there is no possibility of failing to properly engage the binocucorder with the tripod as it is sometimes possible to do with the conventional means, and positive retention of the tube on the post is ensured by inclusion of a resiliently flexible hook formed on one wall of the square tube which engages a suitably configured notch that is provided on the post, the hook being easily disengaged by flexure of the hook out of such engagement while lifting the binocucorder off the tripod. Although the post is shown in the accompanying drawings in order to illustrate the function of the described dependent tube, it is to be understood that the tripod itself forms no part of the invention that is claimed herein.

0019 Finally, since in the case of the detachably mounted camcorder it is possible to manufacture and sell a suitably configured binocular without immediate inclusion of the camcorder, it is a further object to provide such a binocular having a platform as described that is adapted to carry and detachably secure an LCD-inclusive stock camcorder wherein the platform is so configured that the lines-of-sight of said binocular and any such later attached camcorder will necessarily converge at a distance.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

0020 Fig. 1 is a general view in persp ctive of a first embodiment wherein a stock camcorder is detachably mount d on a platform that forms a part of a binocular, the platform being inclin d so as to cause th

camcorder's lin -of-sight to converge toward and intersect the lin -of-sight of the binocular at a distance.

0021 Fig. 2 is a section taken along the line 2-2 of Fig. 1, showing a broken away forward portion of the platform structure that is shown in Fig. 1, the view being in the same perspective and drawn to the same scale as the corresponding structure of Fig. 1 but with a screw element thereof shown in Fig. 2 in exploded relationship.

0022 Fig. 3 shows two elements in exploded perspective relationship, the upper element is a part of the structure of Fig. 1, the lower element a post that is to be provided on a tripod that is not a part of the claimed invention but is shown to illustrate the function of the upper element. More particularly, the upper element is a section similar to that shown Fig. 2 except that a shorter segment of the platform structure is shown, but showing more of a square tube that depends from the underside of the platform, the figure providing a cross-sectional view of that dependent structure.

0023 Fig. 4 is a general perspective view of a second embodiment similar to that of Fig. 1 except that in the Fig. 4 embodiment the camcorder's housing is formed in one piece with the platform that is shown in the Fig. 1 embodiment.

0024 Fig. 5. is a general view in perspective of a third embodiment wherein the camcorder's housing is again formed in one piec with the supporting platform structure but wher in the housing has a forward portion that defines a periscop by m ans of which incident light is rec ived by the

camcorder, the periscope portion of th housing being shown in s ction to afford a view into its interior. In the Fig. 5 embodiment, th periscope is provided with a plain window, preferably made of glass, through which incident light enters the periscope and the camcorder's objective lens is conventionally located in a forward wall of the camcorder's housing.

0025 Fig. 6 is a perspective view similar to that of Fig. 5 but showing only the periscope section and a small portion of the camcorder section of the housing broken away from the remaining structure, the binocular not being shown at all but being understood to be identical to that shown in Fig. 5, the periscope section being sectioned as in Fig. 5. Fig. 6 shows the camcorder's objective lens itself being used as the window through which incident light enters the periscope, the light being then reflected off the mirrors onto the remaining optics of the camcorder which form the final image.

DETAILED DESCRIPTION OF THE INVENTION

0026 Fig. 1 shows a conventional mini-camcorder, less than 7.5 inches in length (190.5mm), indicated generally as 6, having a housing 7 which includes an LCD monitor 8 that is shown in its closed position flush with one side of the camcorder's housing 7. The LCD monitor 8 swings open laterally as indicated by arrow 9. Dashed lines 8A represent the LCD monitor in its opened position. Other familiar elements typical of such a conventional camcorder include a battery 10, viewfinder 11, cassette door 12, objective lens 13 having a line-of-sight 14, a microphone 15 and a video light 16.

0027 A binocular, indicated generally as 17, includ s first and s cond tubular body portions 18, 19, respectively. The binocular body portions 18, 19,

have forward ends which incorporate objective l nses 20, 21, respectiv ly, and rearward nds which d fine eyepi c s, on of which is s en at 22 at the rearward end of binocular body portion 19. The binocular 17 includes a focus adjustment wheel 23 which rotates about the longitudinal axis 24 of the binocular.

0028 The present improvement provides a base member, indicated generally as 25, centered between the binocular body portions 18, 19, forward of the focus wheel 23. The base member 25 has a lower end portion 26 to which the binocular body portions 18, 19, are pivotally secured for limited rotation about a pivot axis 27 which extends parallel to the longitudinal axis 24, whereby the spacing between the binocular's eyepieces is adjustable for user comfort and to obtain a single image that is centered on the binocular's effective line-of-sight 28. The base member 25 has an upper end portion which defines a platform, indicated generally as 29, that extends forwardly of the lower end portion 26 of the base member 25, so as to overlie the open area that normally exists between the forward part of the binocular's body portions 18, 19.

0029 In Fig. 1, the numeral 30 points to a segment of the platform 29 to which the camcorder 6 is detachably secured by conventional means comprising a threaded screw cooperating with a locator pin. These conventional elements are shown in Fig. 2. Fig. 2 shows the forward segment 30 of the platform 29 broken away and sectioned along its plane of symmetry, and it is seen to incorporate a locator pin 31 which is fixed to the segment 30 and rises p rpendicularly from it. A thr aded scr w 32 passes through an opening 33 and is thr ad d into a corr spondingly int rnally threaded

member that is conventionally provided in the undersid of the camcorder, the camcorder's underside also conventionally providing an op ning into which the locator pin 31 is received, whereby the camcorder is firmly secured without possibility of rotation of the camcorder about the tightened screw 32.

0030 In the Fig. 1 embodiment the platform 29 is inclined relative to the line-of-sight axis 28 of the binocular, thereby causing the camcorder's line-of-sight axis 14 to converge with the binocular's line-of-sight at some point in the distance. Notice that the platform 29 is thicker at its rearward end (where the numeral 34 is pointing) than it is at its forward end (where the numeral 29 is pointing). The line-of-sight axes 14 and 28 are in the same plane aligned with the longitudinal axis 24 of the binocular. Accordingly, a target that is located at the point of intersection of the axes 14 and 28 will be centered in the field of view of both the camcorder and the binocular. At other locations of the target along the binocular's line-of-sight axis 28, the target will be less perfectly centered on the camcorder's line-of-sight axis 14.

0031 A means of securing the device to a tripod (not shown) is provided which comprises a tube, indicated generally as 35 in Figs. 1 through 5, inclusive. The drawings show a tube 35 that is square in cross-section. The tube 35 is fixed to and depends from the underside of the platform 29, at or near its forward end, taking advantage of the otherwise open space between the body portions 18, 19 of the binocular, but being located far enough forwardly of the lower portion 26 of the base member 25 as to leave clearance for insertion of the scr w 32, Fig. 2, through the segment 30 of the platform 29 so that the camcorder 6 can be secured.

0032 Fig. 3 shows a tapered post 36 that forms a part of and has been broken away from a tripod (not shown). The post 36 and the tripod of which it is a part, are not part of the invention claimed herein. As seen in Fig. 3, the walls of the tube 35 are tapered on their inside in conformance with the taper of the post 36. The arrow 37, Fig. 3, indicates that the tube 35 is to be lowered onto the post 36, whereupon the tube 35 obtains a jammed fit on the post 36. The square cross-sectional configuration of the tube 35, as well as the post 36, prevents rotation of the tube 35 around the post 36. Two parallel spaced-apart slits 38, Fig. 1, which are here provided in a forward wall of the tube 35, create a segment 39 of said forward wall that can be flexed. A lever 40, Figs. 1 and 3, that is formed on the wall segment 39 facilitates forcible flexure of the wall segment 39. The free lower end of the segment 39, on its inboard surface, is shaped to form a hook 41, Fig. 3. The hook 41 engages a notch 42 that is formed in the post 36, whereby positive retention of the tube 35 on the post 36 is ensured until such time as the user presses the lever 40 inwardly as indicated by arrow 43 in Fig. 3 and thereby withdraws the hook 41 from the notch 42, this being done at the same time as the tube 35 is being lifted off the post 36.

0033 Fig. 4 shows an alternative embodiment, identical to that shown in Fig. 1 in all respects except that its camcorder 6A, has a housing 7A that is formed in one piece with an alternative base member 25A which, like the embodiment of Fig. 1, angularly carries the camcorder 6A such that its line-of-sight axis 14 converges toward and intersects with the line-of-sight axis 28 of the binocular 17 at a distanc in exactly the same manner as in th case of th Fig. 1 mbodiment. Obviously, the Fig. 1 embodiment permits manufacture and sale of th binocular 17 inclusive of the base member 25

that is shown in Fig. 1 but without the stock camcorder 6 that is shown in Fig. 1, permitting after-sale attachment by the user of any brand of camcorder which the user prefers, while the Fig. 2 embodiment necessarily includes the camcorder 6A with the binocular 17.

0034 In the embodiment shown in Fig. 5, a periscope is used at the means of causing the camcorder and the binocular to sight on a common target. A camcorder housing 44 has a rearward portion 45 that contains the operative elements of the camcorder, including the LCD monitor 8 and the cassette door 12. The housing 44 is formed in one piece with a base member 46 to which the binocular body portions 18 and 19 are pivotally secured in exactly the same manner as in the case of the Figs. 1 and 2 embodiments. The rearward or camcorder portion 45 of the housing 44 has a forward wall 47 which defines the forward end of the camcorder per se. The objective lens 48 of the camcorder 45 is mounted in the forward wall 47. The housing 44 has a forward portion 49 that extends forwardly of the camcorder's forward wall 47. The forward portion 49 together with the forward wall 47 form a dust-free compartment that is configured to define a periscope. The forward portion or periscope 49 has a lower end portion 50 that is centered between the objective lenses 20 and 21 of the binocular 17. The lower end portion 50 is provided with a window 51 preferably made of glass but which may be made of any other optically neutral transparent material. A first first-surface mirror 52 is mounted in the lower end portion 50, and a second first-surface mirror 53 is mounted in the upper end portion 54 of the periscope 49. Light processed by the camcorder arrives along the binocular's effective line-of-sight axis 55. Arrow 56 indicates the axis along which light is r c ived centered in objectiv lens 20 of the binocular 17; and arrow 57 indicates the axis along which light is

received centered in objective lens 21 of th binocular 17. The phantom line 58 indicates that the axis 55 is in the same plan as the axes 56 and 57; therefore any image centered in field of view of the binocular 17 will necessarily be likewise centered in the field of view of the camcorder, and the distance of the subject will have no effect on that centering. The first first-surface mirror 52 is mounted at a 45 degree angle relative to the line-of-sight axis 55. The second first-surface mirror 53 is mounted parallel to mirror 52. Incident light arriving along axis 55 and passing through the window 51 strikes the lower mirror 52 which reflects the light 90 degrees upwardly along the path 59 whereby the light strikes the upper mirror 53 which reflects the light another 90 degrees onto the path 60 (the normal light-of-sight axis of the camcorder) into the objective lens 48 of the camcorder 45.

0035 Conventionally, a camcorder includes a video light and a microphone, both of which are conventionally mounted at the forward end of the camcorder's housing. Since the periscope 49 precludes such conventional location, a video light 61 and a microphone 62 are mounted on the periscope, incorporated in a structure 63 that extends from the front of the periscope 49 to the camcorder 45 section of the housing 44, the structure 63 defining a channel on its unseen inside part through which channel the video light and the microphone are electrically connected to the circuitry of the camcorder.

0036 In Fig. 6, the camcorder's objective lens 48 has replaced the plain glass window 51 of the Fig. 5 embodiment, thereby avoiding nonessential passage through glass for least possible light loss. After passage through the objective lens 48 (which, as indicated in Fig. 6, may comprise a subassembly of lenses), received light is reflected off the mirrors 52, 53, along the paths 59, 60, into the next lens 64 which is one of the series of lenses which conventionally comprise the optical system of the camcorder and which process the received light into a final image. It is to be understood that Fig. 6 illustrates only the principle of the arrangement and not necessarily the actual configuration of the objective lens 48.